A Combination of Non-ablative Laser and Hyaluronic Acid Injectable for Postacne Scars: A Novel Treatment Protocol

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BACKGROUND: Postacne facial scars are often associated with significant patient distress. Energy-based devices, including non-ablative lasers, are commonly used for the treatment of postacne scarring. There is relatively limited data regarding the combination of non-ablative lasers with hyaluronic acid injections for postacne scarring. **OBJECTIVE:** We aimed to evaluate the efficacy of a non-ablative 1,540-nm erbium:glass laser combined with a hyaluronic acid injectable for the treatment of postacne scars. **METHODS:** This was a retrospective analysis of 12 patients who underwent the full treatment protocol. A before and after blinded clinical evaluation was performed independently by two dermatologists and graded on a scale from 0 (indicating a worsening of scarring) to 4 (indicating a 76–100% improvement in scarring). Pain perception, adverse effects, and patient satisfaction were evaluated. **RESULTS:** A mean correct blinded before and after evaluation by two dermatologists was 96 percent. Patients demonstrated mild to moderate improvement as assessed by a quartile scale of improvement (25–50%). Mild transient pain was reported by most patients. The satisfaction level of the patients was high (4 out of 5). **LIMITATIONS:** The limitations of our study include the small cohort, retrospective design, and lack of a histological correlation **CONCLUSION:** Our results suggest that this combination treatment using 1,540-nm fractional erbium:glass laser and hyaluronic acid injections is both safe and effective for patients with postacne facial scars.
KEYWORDS: Erbium:glass laser, hyaluronic acid, acne scars, non-ablative laser, fractional laser, soft tissue fillers

Acne scarring is a common detriment to patients' self-esteem and quality of life. There are numerous treatments for postacne scarring, but both patients and physicians constantly pursue more safe and effective treatment modalities that provide minimal downtime and a safer side effect profile.[1]

Current therapeutic modalities for the treatment of postacne scars include, among others: chemical peels, dermabrasion, microneedling, filler injections, surgical procedures, and retinoids.[2–7] Energy-based devices (intense pulsed light [IPL], radiofrequency and lasers) are commonly used for this purpose in recent years. The ablative lasers (the 10,600-nm CO_2 laser and the 2940-nm Er:YAG laser) have significant adverse effects, including dyspigmentation, erythema, edema, and scarring, as well as significant post-procedure downtime, all which make them less desireable options for patients and physicians.[1,3–8] Non-ablative lasers indeed have a better side effect profile and a shorter post-procedure downtime; however, their efficacy in the treatment of postacne scars is heterogenous.[2–7]

Laser fractionation was developed for both ablative and non-ablative lasers, referring to the formation of islands of spared skin adjacent to the treatment zones. The laser beam is manipulated via a defractive lens, in which multiple microscopic laser beams are delivered into microscopic treatment zones, sparing the intervening areas.[8–17] This method of treatment carries minimal epidermal damage, and therefore results in fewer adverse effects and a shorter downtime. Fractionation using the 1,540-nm erbium:glass laser has previously shown to induce collagen production and stimulate dermal remodeling and healing, potentially explaining its effect in skin rejuvenation and in the improvement of postacne scars.[8–17]

Soft-tissue fillers have been used for a myriad of facial contouring and augmentation purposes, as well as for facial postacne scars, however with limited efficacy.[18–22] These soft-tissue fillers include calcium-hydroxylapatite (CaHA), polymethylmethacrylate microspheres in collagen (PMMA-collagen), poly-L-lactic acid injection (PLLA) and hyaluronic acid (HA) gels, among others. There is relatively limited data in the literature regarding the combination of non-ablative lasers with hyaluronic acid injectables for the treatment of postacne scars. We aimed to evaluate the efficacy of a non-ablative 1,540-nm erbium:glass laser combined with a specific highly purified hyaluronic acid injectable for the treatment of postacne scars.

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METHODS

Patients. This was a retrospective cohort study. We included patients 18 years or older who underwent treatment in our clinic using the 1,540-nm fractional erbium:glass laser in combination with a hyaluronic acid injectable due to postacne facial scars.

The exclusion criteria included prior treatment with an ablative laser up to one year prior to the study treatment, prior treatment with any laser up to three months prior to the study treatment, application of any topical treatment up to 14 days prior to the study treatment, pregnancy, and/or a significant systemic illness.

Standardized high-resolution digital photography of the treatment area was performed for each patient at baseline, before each treatment, and at the three-month follow-up visit. All patients gave their written informed consent for the treatment in adherence with acceptable ethical guidelines.

Treatment. The protocol consisted of treatment with a non-ablative 1,540-nm erbium:glass laser (ClearSkin Pro, Alma Lasers, GmbH, Nuremberg, Germany) every four consecutive weeks, with a total of four treatment sessions. The first and third treatment sessions were immediately followed by administering a highly purified hyaluronic acid injectable into the postacne facial scars (Profhilo®, IBSA Farmaceutici Italia Srl, Lodi, Italy, Europe). This is a stabilized hybrid HA complex produced using a patented thermal treatment technology. It consists of combining 32mg of high molecular weight HA (between 1100 and 1400 KDa) and 32mg of low molecular weight HA (between 80 and 100 KDa) in a 2-mL syringe.

The treatment area was disinfected prior to each treatment. Protective eyewear was used during treatments. Laser settings included a spot size of 11*11 mm with a fractionation of 49 pixels, fluence of 2,500 to 3,000mJ/pulse (51–61mJ per pixel). Two stacked pulses were emitted at a rate of 1Hz for 2 to 4 passes per treatment session (2,500mJ/pulse was used for the initial treatment, and increased to 3,000mJ/pulse according to the patient's response). Each treatment session took approximately 20 to 30 minutes. Settings were pre-adjusted according to the tolerability of the patient.

Outcome measures. Patients were followed for 1 to 3 months after the last treatment session. A before/after blinded clinical evaluation was performed independently by two dermatologists, and thereafter graded on a scale from 0 (indicating a worsening of scarring) to 4 (indicating a 76–100% improvement in scarring).

Pain perception was assessed by the patient using a 0 to 10 visual analog scale (VAS), where 0=none and 10=severe. Adverse effects were estimated by the treating physician, as follows: erythema, edema, blistering, flaking, dryness, dyspigmentation and/or pruritus, using a 0 to 3 assessment scale during each treatment and follow-up visits (0= none, 1 = mild, 2 = moderate, 3 = severe). Any additional adverse events were recorded. Patient satisfaction was assessed at the posttreatment follow-up visit at Month 3, graded on a scale of 1 to 5 (1= not satisfied, 5 = very satisfied).

RESULTS

Twelve patients (11 female, 1 male) were included. Ages ranged from 32 to 57 years (mean 44 ± 5.2). Fitzpatrick Skin Types were I to III. All patients had mild to moderate postacne scars at baseline and were seeking to aesthetically improve their appearance. All 12 patients completed both treatment and follow-up period.

The blinded before/after analysis by two dermatologists (D.M, A.N) yielded a correct identification of 100 percent and 92 percent respectively (mean 96%).

Improvement in overall scar appearance occurred gradually over the course of treatment sessions. Following completion of treatment, all patients demonstrated a mild to moderate (25–50%) improvement as assessed by the quartile scale: mean of 1.63 points of improvement in overall scar appearance by evaluator 1 (SD=0.5), and a mean of 2.13 points in overall scar appearance by evaluator 2 (SD=0.65) (mean 1.88 points, SD=0.57). Interobserver agreement for overall improvement was 80 percent. Figures 1 and 2 portray representative cases. Patient-reported satisfaction ranged from 3 to 5 (mean 4 ± 1.06) at the three-month follow up visit. All adverse effects were mild and well-tolerated by patients and included mild transient erythema, mild edema, and mild to moderate pain (mean VAS 3.8 ± 1.5). No vesiculation or scaling were noted. No adverse effects were noted at the follow-up visits. No downtime was reported following treatment by any of the patients.

DISCUSSION

Postacne scars are aesthetically challenging and impose a significant burden on the self-esteem of affected patients. Various treatment modalities are of current use for the treatment of postacne scars, with growing trends towards the non-ablative lasers, in combination with other modalities, such as filler injections, as previously mentioned.[1–6, 18–22] Fractional non-ablative lasers are considered safer modalities compared to the ablative ones as they allow less pain, safer side effect profile and a shorter downtime, as demonstrated in previous studues.[8–17]

We presented a novel combination treatment protocol, which overall demonstrated an average mild to moderate improvement in postacne facial scars appearance, with high patient satisfaction three months after treatment and a good safety profile.

The non-ablative 1,540-nm fractional erbium:glass laser probe utilized in our study can deliver a fluence of up to 3,000 mJ/pulse, which results in significant coagulation and increased efficacy.[2–4,17] Additionally, treatment duration is relatively short, causes no epidermal injury, and therefore allows minimal to no downtime, all which make this treatment attractive for both patients and physicians. Much like other non-ablative modalities, repeated multiple sessions are required.[2–4]

Hyaluronic acid injectables have been used for biomedical applications, including for osteoarthritis treatment, tissue augmentation, and ocular surgery, and as scaffold for tissue engineering.[18,23] In particular, it has been well established that HA is associated with tissue repair, being involved in cell proliferation and migration, partly due to its hydrophilic and highly osmotic features.[18,22–25] In addition, it has been shown to propagate the inflammatory response through the induction of macrophages and chemokine response, thus contributing to the healing process.[23–28] The use of a highly purified hyaluronic acid injectable, has been shown to have an effect in wound healing in *in-vitro* studies, promoting fibroblast and keratinocyte proliferation and migration.[25–28] We believe that this contributes to the synergistic effect of the HA injectable and the non-ablative laser used in our presented protocol.

Limitations. Our study holds several limitations, including a small cohort, a retrospective nature, and lack of a control

group. A histological correlation to support our hypothesis is lacking, and remains to be investigated in the future. However, the clinical response and improvement observed in all of our patients is noticeable, the high patient satisfaction and lack of side effects, and no reported downtime, yields promise for further research.

CONCLUSION

In this study, we demonstrated beneficial outcomes using a new high fluence 1,540-nm fractional erbium:glass laser probe in combination with a highly purified hyaluronic acid injectable, for the treatment of facial postacne scars. Further utilization of this treatment protocol in future larger cohorts is warranted.

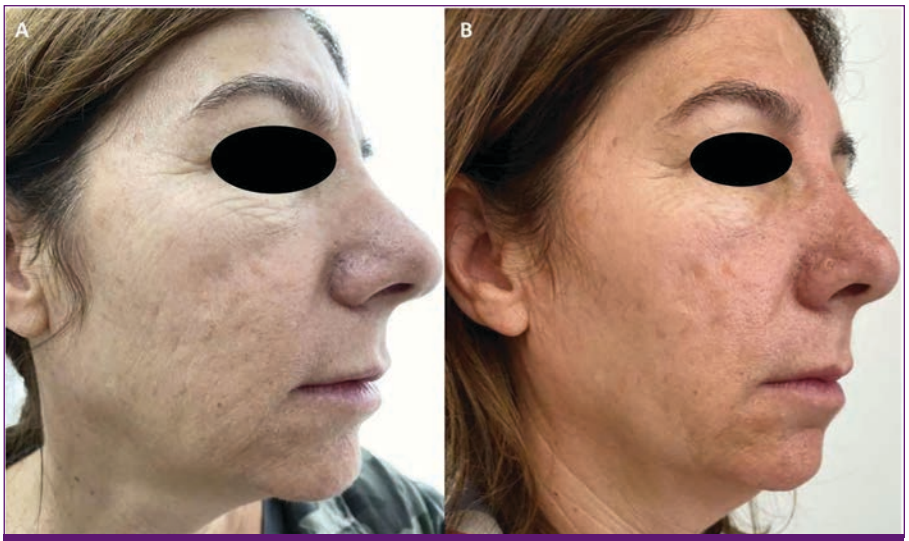

FIGURE 1: Patient #3: **A)** facial scars at baseline versus; **B)** at three months posttreatment with a non-ablative 1,540-nm erbium:glass laser combined with hyaluronic acid injections

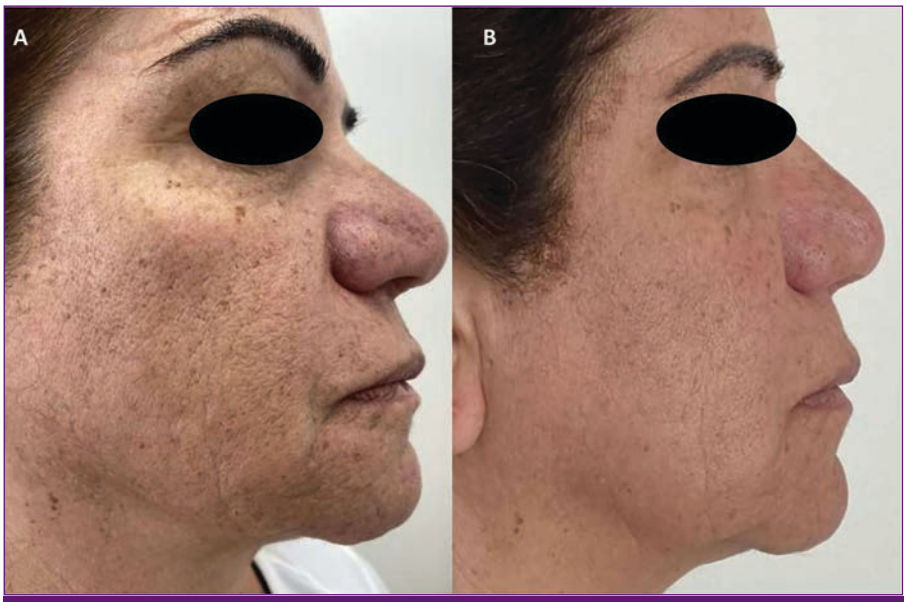

FIGURE 2: Patient #10: **A)** facial scars at baseline versus; **B)** at three months posttreatment with a non-ablative 1,540-nm erbium:glass laser combined with hyaluronic acid injections

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